



EARL JUDSON KING

Obituary Notice

EARL JUDSON KING
(1901–1962)

Earl Judson King, who died on 31 October 1962, was born in Toronto in 1901, the son of Charles W. King, a Baptist minister, and his wife Charlotte Stark King. He obtained a scholarship at Brandon College in 1917 and graduated in chemistry and biology at McMaster University, Ontario, in 1921. King then took a Master's degree in chemistry and proceeded to take his degree of Doctor of Philosophy in 1926, having been awarded a bursary by the Canadian National Research Council. He was offered a post in the new Banting Institute by Sir Frederic Banting, where King became interested in the biochemistry of silicosis and pneumoconiosis, subjects to which he made important contributions throughout his life. In 1927 Earl King married Hazel Keith of Lethbridge, Alberta, who had been a fellow student at Brandon College. In 1928 King went to London to work under Robison in the Lister Institute. It was here that King acquired experience in the field of organic phosphorus compounds and related enzymic problems, and this was the second main line of work which he pursued throughout his scientific career. In the following year he went to Munich to work at the Kaiser Wilhelm Institute. During that time he published several papers with Irvine H. Page. King returned to Toronto late in 1929 to the Banting Institute and the University of Toronto, where he became in due course Associate Professor and Head of the Biochemical Section of the Institute.

In 1934 King accepted an invitation to take charge of the Chemical Pathology Section of the Pathology Department of the newly founded British Postgraduate Medical School (later Postgraduate Medical School of London) at Hammersmith, and was appointed a University Reader in 1935. There he built an efficient department of Chemical Pathology, and in 1945 he became Professor in the University of London, a position which he held at the time of his death.

At the beginning of the Second World War, King joined Sir Alexander Fleming in organizing the pathological services in one of the London Sectors of the Emergency Medical Service, holding the position of Sector Chemical Pathologist. He also became involved in research on antimalarial drugs and problems of chemotherapy of other tropical diseases. He served on various committees connected with the war effort and in 1945 he went to India, holding a position equivalent to that of a

Brigadier, to advise the Medical Directorate, India Command, on chemical pathology. One of the writers of this memoir occupied a similar position in India at about that time and can testify that King's services were greatly appreciated by the Indian Army. King's connexion with the Armed Forces was renewed in 1950, when he became Consultant in Chemical Pathology to the Army.

King returned to his Department in 1946, where he guided its expansion with wisdom, drive and tolerance; he also became increasingly involved with a variety of other bodies both in the United Kingdom and overseas. In 1944 he became Sub-Dean of the Postgraduate Medical School, and between 1943 and 1946 he served as Secretary to the Board of Studies in Biochemistry in the University of London. In 1957 King became Chairman of the combined Department of Pathology at the Postgraduate Medical School at Hammersmith, and Chairman of the Academic Board of this institution. He was Chairman of the Central Academic Council of the British Postgraduate Medical Federation during 1952–55, and of the Board of Studies in Biochemistry in the University of London between 1951 and 1955, Chairman of the British Association of Clinical Biochemists during 1953–55 and President of that body between 1955 and 1958.

King also took an active part in the affairs of the International Union of Pure and Applied Chemistry; he was Chairman of the Commission of Clinical Chemistry between 1951 and 1957 and President of the Biological Chemistry Section from 1959 until his death. He played a helpful part in overcoming difficulties that arose between this relatively old-established scientific Union and the International Union of Biochemistry, which was then seeking recognition. King had also been one of the founders of the Canadian Biochemical Society, and its first Secretary between 1930 and 1934. He also served on committees of the Medical Research Council, bodies connected with silicosis and allied problems of industrial medicine, and many committees connected with clinical biochemistry.

King's scientific work falls into three main categories: silicosis, on which he published about 70 papers; phosphates (over 30 papers); and methods for clinical biochemistry (about 40 papers). The two more specific subjects, namely silicosis and phosphates, date from the very

beginning of King's research work [see King & Lucas (1928; *J. Amer. chem. Soc.* **50**, 2395) on silica, and Baumgartner, King & Page (1929; *Biochem. Z.* **213**, 170) on phosphatase]. King's interest and great contributions to the methods of clinical biochemistry date from 1935, when he came to the British Postgraduate Medical School.

While still in Canada, King developed an accurate micro-method for the estimation of silica, determined the silica content of human tissues and investigated its metabolism. During that time he also showed that rabbits which had been exposed simultaneously to quartz dust and oxides of sulphur developed silicotic nodules particularly quickly. The mechanism by which silica produces its pathological effects is still unknown, and King retained until the end of his life an open mind on this question. He contributed solid evidence to the concept of the adjuvant effect of silica inhalation on tuberculosis infection, and he assumed that this is caused by some action of a soluble silicon compound on tissues. However, King left open the question whether the mechanism is humoral or cellular; but he favoured the idea that soluble silica acted directly on the phagocyte.

While he was at Hammersmith, King was directly and indirectly responsible for a large amount of work involving improvement of experimental and analytical techniques in this field, and he co-operated, in work on pneumoconiosis, extensively with C. V. Harrison and D. A. Mitchison of the Morbid Anatomy and Bacteriology Sections at Hammersmith. He extended his investigations to a variety of other dusts, and in the case of silica he examined carefully, together with G. Nagelschmidt (Safety in Mines Research Establishment, Sheffield), the effects of crystal structure, size and surface properties. Altogether his investigations in this field, which were characterized by thoroughness, inventiveness and critical assessment of results obtained, are likely to be consulted by specialist workers for many years to come. Other co-workers who should be mentioned in this connexion are B. M. Wright (at the M.R.C. Pneumoconiosis Research Unit, Cardiff), S. C. Ray and P. D. Byers.

A bibliography of King's work, especially on silicosis, is given in the Obituary Notice in *J. Path. Bact.* (1963) by J. H. Dible & C. V. Harrison. [See also King & Fletcher, *Industrial Pulmonary Diseases* (a symposium held at the Postgraduate Medical School of London, 18–20 September 1957, and 25–27 March 1958). London: Churchill, 1960.]

King's work on phosphatase, extending over more than 30 years, consists of an essentially empirical study, always with practical ends in view, of a group of clinically important enzymes, of

methods for their determination, and the interpretation of the results. This work stems from the important finding by Armstrong, King & Harris (1934; *Canad. med. Ass. J.* **31**, 14) that experimental retention jaundice produced in dogs by ligating or obstructing the common bile duct was accompanied by very large increases in the plasma phosphatase levels. Whatever may be said about the desirability of systematic units (see, for example, King & Campbell, 1961; *Clin. chim. Acta*, **6**, 301), King-Armstrong units of phosphatase are likely to be remembered by clinicians for a long time, just as certain steroids will continue to be called 'Kendall's Compound E' or 'Reichstein's Substance S'.

King's important contributions to British biochemistry were made in a variety of ways, but his greatest services—apart from those to the Biochemical Society and the *Biochemical Journal*, which we discuss below—lay in his lifelong and successful efforts to develop the science of clinical biochemistry and particularly to lay down high standards of accuracy in a form that could be applied in clinical laboratories. King did not introduce any novel principles into clinical biochemistry, but he applied, improved and elaborated existing methods on a comprehensive scale, insisting always on a high standard of analytical performance.

Only a man of the strongest character, with an essentially practical turn of mind, could have played such a part in the development of a 'border-line' science. Although many others have played important roles, no one man dominated the field in a personal sense as King did, both in Britain and in the international field. That King should have founded the Association of Clinical Biochemists and the International Federation of Clinical Chemistry was natural; that he should—as a man without a medical degree—have been one of the leading spirits in a great medical institution (the Postgraduate Medical School of London), and also one of the very few non-medical members in several medical societies, is a measure of his personal standing.

It is in the light of these services, as a man and as an organizer, that King's purely scientific work in the general field of clinical biochemistry must be seen. King's aim at all times was to provide methods that could and would be used in hospitals of all kinds, especially in the smaller non-teaching hospitals in this country and abroad. This principle underlies the deliberate simplicity of many of King's methods, and emphasis may be laid on the fact that King was one of the pioneers of the use of micro-methods involving 0.1–0.2 ml. of blood, as against 1, 2 or 5 ml. by earlier methods. Two pieces of equipment that had a great influence on the

development of hospital biochemistry during the period 1945–55 by reason of their efficiency, cheapness and simplicity were the grey-wedge photometer (1947; *Biochem. J.* **41**, xxxii) and the direct-reading single-cell photoelectric colorimeter (1942; *Lancet*, i, 511).

This is not to imply that King did not support the introduction of elaborate and expensive equipment if it was really necessary; we may instance here the fact that King's department played a leading part in the introduction of the flame photometer into Great Britain and the use of electrophoresis, fluorimetry and isotopic techniques; indeed, King and his colleagues were the pioneers in this country in the use of automatic analytical methods.

The collection of 'Hammersmith Methods' was first published in King's book *Microanalysis in Medical Biochemistry* in 1946; this was revised in 1951 and again in 1956 (with I. D. P. Wootton). This book, which is one of the standard manuals in the English-speaking world, has been translated into Arabic, Italian, Serbo-Croat and Spanish. Many references to original publications by King and his colleagues and students will be found in this book. The subjects of greatest interest (apart from phosphatase) were determination of blood sugar, bilirubin, chloride, calcium and phosphorus. King's principal collaborators in this work were G. A. D. Haslewood (later at Guy's Hospital), G. E. Delory (later at Winnipeg), D. Beall, Margaret Gilchrist and I. D. P. Wootton.

Study of the methods for the determination of haemoglobin took up much of King's time in the 1940s; a series of papers published in the *Lancet* jointly with a number of other laboratories in this country provided a survey of methods available, their limitations, and the standardization of procedures between laboratories. [See papers with Donaldson and Sisson (National Physical Laboratory), Macfarlane and O'Brien (Oxford), Ramsay (Edinburgh), Peterson (Cardiff) and others: *Lancet*, 1947, ii, 201, 789; 1948, i, 282, 478; ii, 563, 971; 1951, i, 1044.]

King's interest in phosphatase widened during the last years of his life into a more general interest in enzymic methods of all types for clinical purposes (1959; *Amer. J. Med.* **27**, 849).

The standardization of methods, both within and between laboratories, and the control of precision of laboratory methods was a subject to which King devoted much attention during the 1950s. In this, he was greatly assisted by his friend, colleague—and, most appropriately, his successor at Hammersmith—I. D. P. Wootton. (See King, Wootton & Smith, 1951, *Brit. med. Bull.* **7**, 307; King & Wootton, 1953, *Lancet*, i, 470; King, Wootton & Milne, 1954, *Annu. Rev. Biochem.* **23**, 437.)

King's department was indeed a meeting place for many people interested in medical or clinical chemistry in its widest sense, and many biochemists or chemical pathologists, who now occupy professorial appointments or posts of similar status, spent varying periods of time in the Hammersmith Department. Among these should be noted—in addition to those mentioned above—R. V. Coxon, C. E. Dalglish, W. Klyne, G. H. Lathe, A. L. Latner, G. Popják, P. Walker and L. G. Whitby.

King was a generous host in his laboratory, which was always full to overflowing with graduates, senior and junior, and technicians from all over the world. King could never refuse anyone who wanted to benefit from the experience in which his own laboratory was so rich, and he had a specially warm place in his heart for those who came from overseas. The annual departmental photographs which, among many others, decorated King's room in Hammersmith must have contained representatives of nearly every member of the United Nations. This welcome to the stranger was indeed part of the 'Frontier Tradition', for King grew up in a Canada which was much more than 6 hours by jet from London or 90 minutes from New York. It was most characteristic that each year, before Christmas, King would make it his concern to find out whether any visitor or junior colleague was going to be alone on Christmas Day. If this indeed seemed likely, then the visitor or student would immediately be invited to King's house in Wembley; here King was greatly helped by his wife, who died tragically only a few months after he did. Another place where King's talent for hospitality flourished was the Savage Club; as a Brother Savage he was truly in his element.

Although the most important part of King's teaching was done by the apprenticeship method, he played a large part in organizing the section of Chemical Pathology for the London University Diploma in Clinical Pathology.

For five years King was Chairman of the Editorial Board of the *Biochemical Journal*, having served on the Board since 1942. When he took over from F. G. Young in 1947, the *Journal* extended to 640 pages in one year; at the end of his term of office in 1952 the *Journal* was publishing over 2100 pages in a year. The Chairman's task requires many virtues: careful attention to detail (in which King was aided by a succession of excellent secretaries); tact and good sense in dealing with his fellow-editors, and with authors of all ranks, who may range from Nobel Laureates to Ph.D. students; and above all the strict judicial tradition of maintaining scientific standards and the appreciation of true quality, which is the first duty of any editor. All these virtues King showed during his five years of office in the highest degree.

King served on the Committee of The Biochemical Society from 1941 to 1942, from 1946 to 1952 (as Chairman of the Editorial Board) and from 1955 to 1959; from 1957 to 1959 he was Chairman of the Committee. Even when he was not on the Committee, he was one of those to whom the Society's Officers would often turn for advice, knowing that it would always be forthright and practical.

King's services to the Postgraduate Medical School of London will in fact, though not in name, be commemorated by the new School building which is at present under construction, and by the Wolfson Institute which was opened in 1961. From the time that the School launched its appeal for funds in 1957, King was one of the few leading spirits, and he devoted most of his time and energy during the last five years of his life to this appeal. He threw himself with immense enthusiasm into all aspects of the work, particularly visits to the Commonwealth and to the U.S.A., where he had so many former students and friends. These were soon cajoled by King's combination of good humour and persistence into contributing; further, they introduced King and his colleagues to others more wealthy, who have supported most generously the building of the new Postgraduate Medical School.

This rather factual account has probably given an incomplete picture of King's real personality. What Earl King meant as a human being to many of his friends and colleagues all the world over was vividly described by Sir Douglas Logan (Principal of the University of London) in an Address at the Memorial Service at St Columba's Church on 20 November 1962. We can do no better than quote from his opening remarks:

Earl King was an unusual person. On first meeting him it was impossible not to be attracted by the warmth of his personality and the liveliness of his mind. He was one of those rare people who simply cannot help making friends. Part of his immediate charm stemmed, no doubt, from his typically transatlantic lack of inhibitions in his relationships with people, but there was nothing artificial in his manner and approach; he clearly had a genuine interest in his fellow men and women which never failed to make a lasting impression. There is a passage in the Funeral Oration, which was one of Earl's favourite literary readings, where Pericles says of the Athenians that they:

Secured their friends not by accepting favours but by doing them...they conferred benefits, not from calculations of expediency, but in the confidence of liberality.

A. NEUBERGER
W. KLYNE